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Abstract

The Developed countries are developing and designing new automobiles and equipment, as well as producing and supplying high-quality fuels, oils, lubricants and other technical fluids which are exported to other countries. In the case of Mongolia, Mongolia still imports and consumes petroleum products from foreign countries. Various brand's new automobiles with various engine capacities are access to application the day by day. According to this reason the technology of petroleum product production is being developed all over the world for new brand automobiles and vehicles. Therefore new petroleum products with high quality and low environmental impact are being developed. We need to study the product types, categories, quality,property and consumption of this new petroleum products. In Mongolia certain amount of kerosene imported from Republic of China, South Korea and Singapore and stored at the "Liquid Fuel Transshipment Facility" in Zamiin-Uud sum, Dornogobi province. Every year imported kerosene amount is increased. In this work we studied the characteristics of imported kerosene according to with MNS 6855: 2020 which is newly approved standart about kerosene. Densities in 15 °C temperature of imported kerosene in 2018,2019,2020 and 2021 were 788.0, 791.4, 788.0 and 774.8 kg/m^3 respectively. Flash points in closed crucible of imported kerosene in 2018, 2019, 2020 and 2021 were 46.73-50.42, 67.2-83.2 49.4 and 74 °C respectively.

Introduction

The kerosene is a middle distillate of the petroleum refining process, defined as the fraction of crude oil that boils between 145 and 300°C (U.S. Environmental Protection Agency [EPA] 2011) and resulting in a mixture with a density of 0.78–0.81 g/cm^3 composed of carbon chains that typically contain between 10 and 16 carbon atoms per molecule. It is also used as a coolant in the production and processing of metals (in the absence of oxygen). In the oil industry, kerosene is used as a synthetic hydrocarbon in field oil corrosion tests.

In this sense, kerosene must meet the following requirements in terms of properties. Where:

- Well evaporate for complete combustion
- The combustion heat is high enough to predict the flight distance of the aircraft
- High transmittance and low temperature quality to ensure continuous supply of fuel to the combustion chamber
- Chemical and thermal oxidation stability is high, low sedimentation
- Does not contradict various materials, does not corrode metals, does not adversely affect technical rubber fabrics

In this study, to compare the characteristics of imported kerosene with the latest standard (MNS) [5] and the previously used standard (GOST), and to identify similarities and differences of imported kerosene and new and old standards

Methods And Materials

Materials. Kerosene imported and stored at the "Liquid Fuel Transshipment Facility" in Zamiin-Uud sum, Dornogobi province .

Methods and standards. Kerosene sample prepared MNS 218: 2008 standard is used for sampling of products in vertical and horizontal tanks, various vehicles, as well as small containers such as containers, barrels, cans and bags in order to determine the physical and chemical parameters of the quality of oil and oil products. An average sample was prepared and analyzed from each of the 4th tanks of the same oil product, which is the only oil product specified in 5.6.2 of the standard, at a level of 0.33 of the diameter of at least 2 tanks in total.

The below characteristics of imported kerosene is studied according to latest standard (MNS) [5] and the previous standard (GOST).

1. Density at 15.20 °C temperature
2. Flash point in closed crucible
3. Total sulfur content
4. Composition of kerosene
5. Kinematic viscosity at 20 °C temperature
6. Copper plate analysis

Figure 1. Laboratory equipments for kerosene quality

Results

In the Liquid Fuel Transshipment Facility of Zamiin-Uud sum, Dornogobi province, an average of 108.57 tons of petroleum products are imported and stored annually, of which 39.83 tons are kerosene. Among petroleum products, kerosene is currently duty-free product and it is imported higher amount than other petroleum products. Therefore, stored kerosene is regularly monitored and kerosene quality is controlled.

In this study, we analyzed samples of kerosene delivered to the liquid fuel transshipment facility in 2018, 2019, 2020 and 2021 and compared the analyzing results. Samples of kerosene received in 2018 and 2019 were analyzed by according to old GOST standards which is followed in Mongolia. But kerosene samples in 2020 and 2021 were analyzed by according to the newly approved MNS standard in Mongolia in 2020.

Table 1. Analysis results of imported kerosene in 2018, 2019

Parameter name	Standard amount /GOST/	Analyzed standard	2018	2019
Visibility of kerosene	-	Visually	Clear, clean and odorless	Clear, clean and odorless
Color	-	MNS ASTM D 156	Colorless	Colorless and transparent
Density in 15 °C temperature kg/m^3	823.5	MNS GOST R 51069	788.0	791.4
Density in 20 °C temperature kg/m^3	-	MNS 0481	789.5-801.1	788.5-810.3
Boiling point, °C	-	MNS ISO 3405	102.7-113.93	108.8-143.9
10% distillation temperature, °C	130-180		147.3-159.2	155.6-165.5
50% distillation temperature, °C	175-200		189.7-200.5	183.5-206.1
90% distillation temperature, °C	270		232.4-242.6	210.2-211.4
End of boiling point, °C	-		255.29-267.0	220.3-229.7
Residue in flask,% by volume	-		0.4-1.36	0.9-2.95
Residue and loss,% of volume	-		0.5-1.3	0-1.1
Actual resin amount, mg/100 ml	12	MNS 477	0.3-0.6372	0.62-4
Copper plate analysis	-	MNS ISO 2160	1a	1a
Total sulfur content, %	0.12	GOST R 51947	0.00038-0.00622	0.0015-0.0018
Flash point in closed crucible, °C, not less	38	MNS 333	46.73-50.42	67.2-83.2
The viscosity at 20 °C temperature, mm2/sec	-	MNS 0480	46.73-50.42	67.2-83.2

Table 2. Analysis results of imported kerosene in 2020, 2021

Parameter name	Standard amount /MNS/	Analyzed standard	2020	2021
Density at 15°C temperature, kg/m^3, not less	775	ASTM D 4052 MNS 0481	788.0	774.8
Composition: - 10% distillation temperature, °C, not much	300	MNS ISO 3405	157.2 °C	160°C
- Boiling point, °C, not much	205	ASTM D86	135 °C	72°C
Copper plate analysis (3 h, at 50°C)	Category 1	MNS 0326 ASTM D130	Category 1	Category 1
Total sulfur content, % , not much	0.3	ASTM D4294 ASTM D5453	0.0004	0.0003591
The viscosity at 40 °C temperature, m^2/sec	1.0-1.9	MNS ASTM D445	1.2	1.3217
Flash point in closed crucible,°C , not much	38	MNS 333 ASTM D56	49.4	72
Color and appearance	Colorless, translucent	Observe with eye	Colorless, translucent	Colorless, translucent

Discussion

The kerosene imported to Mongolia in 2018 and 2019 is dominated by light hydrocarbons and aliphatic hydrocarbons. The actual resin amount of imported kerosene in 2018 and 2019 is less than the standard amount. In addition, the actual resin amount of kerosene in 2018 will be less than the actual amount of resin in 2019. Due to the low resin amount, imported kerosene does not contain asphaltic hydrocarbons or saturated hydrocarbons. The color of the copper plate does not change much, it is indicates that imported kerosene does not contain free sulfur. The flash point in closed crucible of imported kerosene in 2018 and 2019 is higher than the standard value. It means that imported kerosene is not easily flamed. In 2020, the standard for technical requirements for kerosene was updated (MNS 6855: 2020). Kerosene is imported in 2020 and 2021 was analyzed in according by newly approved MNS standard in Mongolia in 2020. The kerosene imported to Mongolia in 2020 and 2021, composition of kerosene is dominated by light hydrocarbons and aliphatic hydrocarbons. The imported kerosene does not contain free sulfur. The low sulfur content in kerosene is good indicator and it has the advantage of reducing corrosion of equipment. The kerosene of imported kerosene has good molecular mobility and relatively low condensation. The flash point in closed crucible of kerosene, which are imported in 2020 and 2021, is higher than MNS 6855: 2020 standard.

Conclusions

The kerosene samples, which are imported in 2018 and 2019, there were stored in the Liquid Fuel Transshipment Facility in Zamiin-Uud soum of Dornogovi aimag, were analyzed in accordance with GOST standards. Imported kerosene quality met requirements of GOST standard. The kerosene samples, which are imported in 2020 and 2021, analyzed by according to MNS 6855: 2020. Imported kerosene quality met requirements of MNS standard.

Comparing GOST and MNS standards, in the new MNS standard, density in 15 °C temperature (kg/m^3) was decreased from 823.5 to 775, 10% distillation temperature(°C) was increased from 130-180 to 300, total sulfur content (%)) was increased from 0.12 to 03.

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